

National Park Service
U. S. Department of Interior

Cape Cod National Seashore
Massachusetts



Highlands Center at Cape Cod National Seashore

APPENDIX TO THE Site and Building Design and Rehabilitation Handbook



September 2005

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Appendix A

Green Building Options

This list of green building options is intended to aid Program Partners in developing green building practices. **Please note that this entire section is excerpted from the “Atlantic Learning Center Sustainability Guidelines,”** prepared by the Architectural Energy Corporation with the assistance of the National Renewable Energy Laboratory (and funded by the Federal Energy Management Program). These guidelines were used in suggesting rehabilitation decisions for the National Park Service’s Atlantic Research Center at the Highlands Center. Program Partners should review these sustainability suggestions with their architect or engineer. As improved technologies and practices are developed, they should be considered, as well.

Tight Construction & Insulation

Provide construction specification requirements for “tight” construction practices to minimize infiltration to save energy and maintain indoor comfort conditions. Specify an air-tight seal around windows, doors, and electrical outlets on exterior walls; keep any ductwork within the insulated envelope of the building. Make use of sheltered or double entry doors to protect the interior from the infiltration of cold blasts of winter winds, as feasible.

Provide high levels of insulation in the walls and roof, exceeding code requirements. If maintaining the exposed ceiling is desired, use rigid insulation above the ceiling.

High Performance Glazing

The use of a high performance glazing system in renovation provides an important exterior expression of energy efficiency and climate adaptation, while providing the following energy and daylighting benefits:

- Solar heat gain control – A combination of tinted glass, fritted glass, low emissivity (low-e) coatings, and interior fenestration systems can control solar heat gain.
- Visible light control – Glazing transmission tuned by orientation is used to control the visible light transmission of the glazing in the field of view of the occupants.
- Heat loss control – Reduced thermal conductance typical of low-e glass minimizes heat losses and maintains thermal comfort in interior spaces.

Efficient Electric Lighting

T8 fluorescent lamps have become the industry standard for efficient lamps in commercial office buildings. Recently an alternative, a T5 lamp, has shown greater potential for energy efficiency and illumination quality. A standard 28 watt T5 lamp produces over 100 lumens/watt compared to a 32 watt T8 lamp, which produces around 90 lumens/watt. The newer T5 lamps are able to

render colors and objects in a room much better than their predecessor, with color rendering indexes of 85 instead of 75. In order to closely match daylight with electrical light, a lamp color temperature of 4100K or above is recommended.

Compact fluorescent lights (CFL) continue to evolve in the commercial marketplace. In most commercial applications, a CFL can replace an incandescent or tungsten-halogen bulb, resulting in 75% less electricity consumption, 10 times longer bulb life, and lower cooling loads. CFLs are available in a wide range of color temperatures to accommodate any application. These are a good alternative for incandescent lights in applications such as down lights and wall washers.

Daylighting

Several benefits derive from incorporating daylighting into the design. Daylighting provides the occupant a higher quality space and luminous environment. The occupants will perceive the passage of time due to the movement of the sun and changing sky conditions throughout the day. Daylight harvesting can also decrease both building electrical lighting consumption and building cooling loads with proper lighting and Heating, Ventilation and Air Conditioning (HVAC) controls.

While a daylighting solution can use a combination of strategies, the basic daylighting building blocks generally fall into two broad categories – side lighting and top-lighting strategies. Daylighting glazing for side lighting should be placed as close to the ceiling as possible. Top-lighting strategies provide daylight access through rooftop apertures.

High Efficiency HVAC

The goal for the HVAC system is to meet the required loads (for interior comfort) as efficiently as possible. The HVAC system will be required to meet heating and ventilation requirements and possible cooling requirements. The team needs to define comfort requirements in each area, especially humidity control requirements before system selection and control options can be selected.

Proper sizing is very important because it typically results in a small boiler, which can save up-front capital construction cost. Carefully review load calculations and safety factors to verify that the specified boiler size is appropriate. A high efficiency, modulating boiler is recommended. A modulating boiler can usually maintain its nominal efficiency down to the low end of the modulation range.

Natural Ventilation

Cape Cod is not ideal for natural ventilation (high nighttime temperatures preclude night time “flushing,” and high humidity levels potentially cause issues with thermal comfort).

There are two basic principles for natural ventilation: Wind-induced and stack-induced (also known as temperature-induced). Wind causes pressure differences on the windward versus leeward side of the building, causing air movement through the building. The stack effect is caused by buoyancy resulting from differences in air density. Heat and humidity given off by occupants and other internal heat sources in buildings tend to make air rise. The stale, heated air

escapes from openings in the ceiling or roof and permits fresh air to enter from lower openings to replace it.

A ridge vent is an opening at the highest roof point that offers a good outlet for both buoyancy and wind-induced ventilation. The ridge opening should be free of obstructions.

Clerestories (windows in exterior walls that rise above the roof line) or vented skylights can provide an opening for air to escape in a buoyancy ventilation strategy. The light well of the skylight can also act as a mini-solar chimney that increases flow. Openings low in the structure should be provided to act as inlets. In general, it is best to make the outlet openings slightly larger than the inlet openings to create a negative pressure differential and encourage airflow out of the building.

Ceiling and whole-building fans can provide up to 9°F effective temperature drop at one-tenth the electrical energy consumption of mechanical air conditioning systems.

Passive Solar

General or rule-of-thumb recommendations are difficult in passive solar design since it is the integrated interaction of many energy-efficient strategies that produce effective passive solar design. Direct gain systems are systems where sunlight directly (and indirectly) charges thermal mass materials such as masonry floors and walls, and then “gives up” or distributes the absorbed heat to the space.

The following are just some of the systems that may play an interactive role in the renovated buildings: Daylighting, glazing, overhangs, energy-efficient lighting, lighting controls, insulation, air-leakage control, thermal mass, natural ventilation, economizer cycle, high-efficiency HVAC and HVAC controls. Night insulation of direct gain (exterior) windows improves thermal performance by reducing heat loss at night. High quality, low-e glazing is critical and may be sufficient for insulation. Additional heavy drapes manufactured with an aluminum foil layer can provide up to R-4 insulation.

Renewable Energy

Two viable renewable energy sources for the ALC are solar (photovoltaic) and wind power. Although it is not possible to analyze or recommend renewable energy alternatives without an electrical and heat load analysis, a few general observations are possible. Using Boston weather data, the wind resource average speed is 6 m/s (higher in winter), and at sea level there is a fairly high air power density. The solar resource has an average insolation (rate of delivery of solar radiation) of 4.4kWh/m²/day (and is higher in the summer). These two renewable energy technologies, therefore, may make a nice hybrid complement on Cape Cod. Both wind and solar technologies, particularly photovoltaics (PV), and, to a lesser extent, building integrated photovoltaics (BIPV), may prove cost prohibitive. As an environmental education outreach venue, however, it is valuable to have demonstration projects of renewable technologies.

Solar thermal domestic hot water is another renewable energy alternative. If there will be no showers in the buildings, the technology may not be a good alternative given the minimal hot water needs and fairly overcast conditions in the winter. When compared to electric hot water

heat, solar hot water systems almost always make economic sense. When compared to natural gas or oil water heating, solar hot water systems are most cost effective in (1) areas with excellent solar resource, (2) areas with high or variable costs of fuel, or (3) facilities with large hot water requirements.

Water Conservation

Water conservation could be a combination of efficient plumbing fixtures, use of Xeriscape or drought tolerance principles to establish and maintain the landscape, use of reclaimed water if available, and proper management of rainwater. Water consumption reduction typically results in lower operating costs. Reductions of heated water also contribute to building energy savings. Water metering will be performed to encourage and confirm water conservation.

Water conserving practices involve the following: low water consumption toilets, urinals, faucets, and shower-heads (as applicable), waterless urinals; water-efficient landscaping using plants tolerant of climate, soils, and natural water availability; pervious paving and rainwater collection to minimize surface runoff; and recycling and filtering gray water.

Commissioning

Commissioning is a systematic process of ensuring that the building systems perform according to the design intent and the owner's operational requirements. Commissioning typically includes documenting the design intent, followed by activities in the construction, acceptance, and warranty phases of the project to determine actual performance and making adjustments of building systems as necessary.

Sustainable Construction Practices

Sustainable buildings are designed and operated with the goal of minimizing their impact on the environment while assuring the health of the occupants. Materials should be selected based upon specific environmental criteria (i.e. factory recycling programs, toxic emissions, recycled content) and traditional building concerns (i.e. program, schedule, budget, durability, and aesthetics). The production and use of these materials means less energy consumption, less natural resource depletion, less pollution, and fewer toxins.

Although material selection is somewhat limited for a renovation project, the following are suggested interior finish products with recycled content:

- Carpet – High recycled content commercial grade carpet is available.
- Insulation – Realistic recycled goals are at least 75% for cellulose and 25% for fiberglass.
- Ceiling Tile – Acoustical tile can be specified with a minimum of 25% recycled content.
- Gypsum Board and Sheathing – Recycled content products are available.

- Other interior finishes – Ceramic and porcelain tile, resilient flooring, panel fabrics, tackable surfaces, furniture systems, and others can be specified to have recycled content materials.

In addition, every effort should be made to reuse any salvageable building materials, to select products that are local or regional materials, to use only certified wood products and to specify products and processes that promote good indoor air quality (materials with low Volatile Organic Compounds (VOC) content, natural materials, etc.)

Construction Waste Management

To promote sustainable building practices, every effort should be made to properly dispose of any demolition waste. When construction and renovation begins, a construction waste management plan should be in place to ensure that all construction scrap is properly disposed of or recycled whenever possible. Examples may include drywall, metal, and wood scraps; existing asphalt or concrete from site; and reuse of existing fill from the site.

Appendix B

Native Plant List

The following table lists the plants that are native, non-invasive species that may be considered for plantings on the grounds of the Highlands Center.

<u>SPECIES</u>	<u>COMMON NAME</u>	<u>FORM</u>
Asplenium platyneuron	ebony spleenwort	fern
Athyrium filix-femina var. asplenioides	southern lady-fern	fern
Botrychium dissectum	cut-leaved grape fern	fern
Botrychium lanceolatum	lance-leaved grape fern	fern
Botrychium matricariifolium	daisy-leaf grape fern	fern
Botrychium multifidum	leathery grape-fern	fern
Dennstaedtia punctilobula	hay-scented fern	fern
Dryopteris carthusiana	spinulose wood-fern	fern
Dryopteris cristata	crested wood-fern	fern
Dryopteris intermedia	intermediate wood-fern	fern
Dryopteris marginalis	marginal wood-fern	fern
Dryopteris x bootii	Boott's wood fern	fern
Onoclea sensibilis	sensitive fern	fern
Ophioglossum pusillum	adder's-tongue fern	fern
Osmunda cinnamomea	cinnamon fern	fern
Osmunda regalis	royal fern	fern
Phegopteris connectilis	northern beech-fern	fern
Polypodium virginianum	common polypody	fern
Pteridium aquilinum var. latiusculum	bracken fern	fern
Pteridium aquilinum var. pseudocaudatum	Pine Barrens bracken	fern
Thelypteris noveboracensis	New York fern	fern
Thelypteris palustris	marsh fern	fern
Thelypteris simulata	Massachusetts fern	fern
Woodwardia areolata	netted chain-fern	fern
Woodwardia virginica	Virginia chain-fern	fern
Agrostis hyemalis	southern ticklegrass	grass
Agrostis perennans	upland bentgrass	grass
Agrostis scabra	northern ticklegrass	grass
Agrostis stolonifera	creeping bentgrass	grass
Ammophila breviligulata	beachgrass	grass
Andropogon glomeratus var. glomeratus	bunched broom-sedge	grass
Aristida dichotoma	poverty-grass	grass
Aristida purpurascens	purple needlegrass	grass
Calamagrostis canadensis	bluejoint	grass
Chenchrus longispinus	sandspur	grass
Cinna arundinacea	wood reedgrass	grass
Danthonia spicata	poverty oatgrass	grass
Deschampsia flexuosa	common hairgrass	grass
Dichanthelium acuminatum	panic-grass	grass
Dichanthelium acuminatum var.	panic grass	grass

fasciculatum		
Dichanthelium acuminatum var. lindheimeri	Lindheimer panicgrass	grass
Dichanthelium clandestinum	riverside panic-grass	grass
Dichanthelium commonsianum	common's panic-grass	grass
Dichanthelium commutatum	changeable panic-grass	grass
Dichanthelium depauperatum	depauperate panic-grass	grass
Dichanthelium dichotomum	forked panic-grass	grass
Dichanthelium meridionale	pondshore panic-grass	grass
Dichanthelium oligosanthes	Scribner's panic-grass	grass
Dichanthelium sabulorum	hemlock rosette-grass	grass
Distichlis spicata	alkali-grass	grass
Echinochloa walteri	water-millet	grass
Elymus virginicus	wild rye	grass
Elytrigia repens	quack grass	grass
Eragrostis pectinacea	Carolina lovegrass	grass
Eragrostis pilosa	India lovegrass	grass
Eragrostis spectabilis	purple lovegrass	grass
Festuca rubra ssp. rubra	red fescue	grass
Glyceria canadensis	rattlesnake grass	grass
Glyceria obtusa	coastal mannagrass	grass
Hierochloa odorata	sweet grass	grass
Leersia oryzoides	rice cut-grass	grass
Leymus mollis	sea lyme-grass	grass
Muhlenbergia mexicana	satin muhly	grass
Muhlenbergia uniflora	pondshore muhly	grass
Panicum capillare	witch-grass	grass
Panicum dichotomiflorum var. puritanorum	Svenson's or fall panic-grass	grass
Panicum rigidulum var. rigidulum	redtop panic grass	grass
Panicum virgatum var. spissum	saltmarsh switchgrass	grass
Paspalum setaceum	bead-grass or thin paspalum	grass
Phalaris arundinacea	reed canarygrass	grass
Phragmites australis	common reed	grass
Piptochaetium avenaceum	blackseed speargrass	grass
Puccinellia maritima	seaside alkali-grass	grass
Puccinellia tenella (ssp. langeana)	Northern alkali-grass	grass
Schizachyrium scoparium	little bluestem	grass
Spartina alterniflora	smooth cordgrass	grass
Spartina cynosuroides	salt reedgrass	grass
Spartina patens	salt meadow cordgrass	grass
Spartina pectinata	prairie cordgrass	grass
Sphenopholis pensylvanica	swamp oats	grass
Torreyochloa pallida var. pallida	pale mannagrass	grass
Triplasis purpurea	purple sand-grass	grass
Typha angustifolia	narrow-leaved cattail	grass
Typha latifolia	common cattail	grass
Vulpia octoflora	six-weeks fescue	grass
Zizania aquatica	wild rice	grass
Acorus americanus	sweet flag	forb/herb
Agalinis maritima	seaside gerardia	forb/herb
Agalinis paupercula	small-flowered gerardia	forb/herb
Agalinis purpurea var. parviflora	smooth agalinis	forb/herb
Allium canadense	wild onion	forb/herb
Ambrosia artemisiifolia var. elatior	ragweed	forb/herb
Anaphalis margaritacea	pearly everlasting	forb/herb

Anemone quinquefolia	wood-anemone	forb/herb
Angelica lucida	seaside angelica	forb/herb
Antennaria howellii ssp. neodioica	Greene's pussytoes	forb/herb
Antennaria plantaginifolia	plantain-leaved pussytoes	forb/herb
Apios americana	groundnut	forb/herb
Apocynum androsaemifolium	spreading dogbane	forb/herb
Apocynum cannabinum	Indian hemp	forb/herb
Aralia hispida	bristly sarsaparilla	forb/herb
Aralia nudicaulis	wild sarsaparilla	forb/herb
Arethusa bulbosa	arethusa	forb/herb
Arisaema triphyllum	jack-in-the-pulpit	forb/herb
Artemisia campestris ssp. caudata	seaside wormwood	forb/herb
Asclepias amplexicaulis	blunt-leaved milkweed	forb/herb
Asclepias incarnata ssp. pulchra	downy swamp milkweed	forb/herb
Asclepias syriaca	common milkweed	forb/herb
Asclepias tuberosa	butterfly weed	forb/herb
Aster divaricatus	white wood aster	forb/herb
Aster paternus	white-topped aster	forb/herb
Aster solidagineus	narrow-leaved white-topped aster	forb/herb
Aster spectabilis	showy aster	forb/herb
Aster umbellatus	tall flat-topped white aster	forb/herb
Atriplex glabriuscula	spearscale	forb/herb
Atriplex pentandra	sea-beach orache	forb/herb
Aureolaria flava	smooth false foxglove	forb/herb
Aureolaria pedicularia	fern-leaf false foxglove	forb/herb
Aureolaria virginica	downy false foxglove	forb/herb
Baptisia tinctoria	yellow wild indigo	forb/herb
Bartonia paniculata	screw-stem	forb/herb
Bartonia virginica	screw-stem	forb/herb
Bidens connata	swamp beggar-ticks	forb/herb
Boehmeria cylindrica	false nettle	forb/herb
Brasenia schreberi	water-shield	forb/herb
Cakile edentula	sea rocket	forb/herb
Callitriche heterophylla	water-starwort	forb/herb
Calopogon tuberosus	grass-pink	forb/herb
Calystegia sepium	hedge bindweed	forb/herb
Cardamine parviflora var. arenicola	narrow-leaved bittercress	forb/herb
Cardamine pennsylvanica	bittercress	forb/herb
Ceratophyllum demersum	Hornwort	forb/herb
Chamaesyce maculata	spotted spurge	forb/herb
Chamaesyce polygonifolia	seaside spurge	forb/herb
Chamerion angustifolium	fireweed	forb/herb
Cicuta bulbifera	bulblet water hemlock	forb/herb
Cicuta maculata	water hemlock	forb/herb
Circaea lutetiana ssp. canadensis	enchanter's nightshade	forb/herb
Cirsium discolor	field thistle	forb/herb
Cirsium horridulum	yellow thistle	forb/herb
Cirsium pumilum	pasture thistle	forb/herb
Comandra umbellata	bastard toad-flax	forb/herb
Coreopsis rosea	pink tickseed	forb/herb
Cuscuta cephalanthi	buttonbush dodder	forb/herb
Cuscuta gronovii	common dodder	forb/herb
Cypripedium acaule	pink lady-slipper	forb/herb
Desmodium obtusum	stiff tick-trfoil	forb/herb
Drosera filiformis	thread-leaved sundew	forb/herb

Drosera intermedia	sundew	forb/herb
Drosera rotundifolia	round-leaved sundew	forb/herb
Elatine minima	lesser waterwort	forb/herb
Elodea nuttallii	Nuttall's water-weed	forb/herb
Epifagus virginiana	beech-drops	forb/herb
Epilobium ciliatum	American willow-herb	forb/herb
Epilobium coloratum	purple-leaved willow-herb	forb/herb
Epilobium leptophyllum	narrow-leaved willow-herb	forb/herb
Erechtites hieraciifolia var. hieracifolia	fireweed	forb/herb
Erigeron annuus	daisy fleabane	forb/herb
Erigeron philadelphicus	pink fleabane	forb/herb
Erigeron strigosus var. beyrichii	rough fleabane	forb/herb
Eriocaulon aquaticum	pipewort	forb/herb
Eupatorium dubium	Atlantic joe-pye-weed	forb/herb
Eupatorium hyssopifolium	hyssop-leaved boneset	forb/herb
Eupatorium perfoliatum	boneset	forb/herb
Eupatorium pilosum	rough boneset	forb/herb
Eupatorium rotundifolium var. ovatum	hairy boneset	forb/herb
Euthamia graminifolia var. graminifolia	flat-top goldenrod	forb/herb
Euthamia tenuifolia	slender goldenrod	forb/herb
Fragaria virginiana	wild strawberry	forb/herb
Galium aparine	cleavers	forb/herb
Galium circaezans var. hypomalacum	wild licorice	forb/herb
Galium palustre	marsh bedstraw	forb/herb
Galium pilosum	hairy bedstraw	forb/herb
Galium tinctorium	stiff marsh bedstraw	forb/herb
Galium trifidum	bedstraw	forb/herb
Galium triflorum	sweet-scented bedstraw	forb/herb
Geranium carolinianum var. confertiflorum	Carolina crane's bill	forb/herb
Geranium maculatum	spotted crane's bill	forb/herb
Geum canadense	white avens	forb/herb
Glaux maritima	sea-milkwort	forb/herb
Gratiola aurea	yellow hedge-hyssop	forb/herb
Helianthemum canadense	Canadian rockrose	forb/herb
Helianthemum dumosum	bushy rockrose	forb/herb
Helianthemum propinquum	low rockrose	forb/herb
Helianthus divaricatus	woodland sunflower	forb/herb
Heracleum maximum	cow-parsnip	forb/herb
Hibiscus moscheutos	rose mallow	forb/herb
Hieracium canadense var. fasciculatum	Canada hawkweed	forb/herb
Hieracium gronovii	hairy hawkweed	forb/herb
Hieracium marianum (gronovii x venosum)	Maryland hawkweed	forb/herb
Hieracium scabrum	rough hawkweed	forb/herb
Hieracium venosum var. nudicaule	rattlesnake weed	forb/herb
Honckenya peploides ssp. robusta	sea-prslane	forb/herb
Hydrocotyle umbellata	water pennywort	forb/herb
Hydrophyllum virginianum	Eastern waterleaf	forb/herb

Hypericum boreale	northern dwarf St. John's-wort	forb/herb
Hypericum canadense	Canadian St. John's-wort	forb/herb
Hypericum dissimulatum	Bicknell's St. John's-wort	forb/herb
Hypericum gentianoides	orange-grass	forb/herb
Hypericum mutilum	dwarf St. John's-wort	forb/herb
Impatiens capensis	orange jewel weed	forb/herb
Ionactis linariifolius	stiff aster	forb/herb
Iris versicolor	blue flag	forb/herb
Krigia virginica	dwarf dandelion	forb/herb
Lactuca biennis	tall blue lettuce	forb/herb
Lactuca canadensis	yellow wild lettuce	forb/herb
Lactuca hirsuta var. sanguinea	hairy wild lettuce	forb/herb
Lactuca x morssii (biennis x canadensis)	Morss' wild lettuce	forb/herb
Lathyrus japonicus var. maritimus	beach pea	forb/herb
Lathyrus palustris	marsh vetchling	forb/herb
Lechea intermedia	pinweed	forb/herb
Lechea maritima	beach pinweed	forb/herb
Lechea mucronata	hairy pinweed	forb/herb
Lechea pulchella var. pulchella	Leggett's pinweed	forb/herb
Lepidium virginicum	poor-man's peppergrass	forb/herb
Lespedeza hirta	hairy bush-clover	forb/herb
Lespedeza procumbens	trailing bush-clover	forb/herb
Lespedeza stuevei	velvety bush-clover	forb/herb
Ligusticum scoticum	sea-lovage	forb/herb
Lilium philadelphicum	wood-lily	forb/herb
Limonium carolinianum	sea lavender	forb/herb
Lindernia dubia var. anagallidea	false pimpernel	forb/herb
Linnaea borealis	twinflower	forb/herb
Liparis loeselii	green twayblade	forb/herb
Lobelia cardinalis	cardinal flower	forb/herb
Lobelia dortmanna	water lobelia	forb/herb
Ludwigia palustris	water purslane	forb/herb
Lupinus perennis	wild lupine	forb/herb
Lycopus americanus	American water-horehound	forb/herb
Lycopus amplexans	sessile water-horehound	forb/herb
Lycopus rubellus	swamp water-horehound	forb/herb
Lycopus uniflorus	northern water-horehound	forb/herb
Lycopus virginicus	Virginia water-horehound	forb/herb
Lysimachia ciliata	fringed loosestrife	forb/herb
Lysimachia quadrifolia	whorled loosestrife	forb/herb
Lysimachia terrestris	yellow loosestrife	forb/herb
Maianthemum canadense	Canada mayflower	forb/herb
Maianthemum racemosum	false Solomon's seal	forb/herb
Medeola virginiana	Indian cucumber	forb/herb
Melampyrum lineare var. latifolium	broad-leaved cow-wheat	forb/herb
Melampyrum lineare var. lineare	common cow-wheat	forb/herb
Melampyrum lineare var. pectinatum	pine barrens cow-wheat	forb/herb
Menyanthes trifoliata	buckbean	forb/herb
Mertensia maritima	oysterleaf	forb/herb
Mitchella repens	partridge-berry	forb/herb
Moehringia lateriflora	grove-sandwort	forb/herb
Monotropa hypopithys	pinemap	forb/herb
Monotropa uniflora	Indian pipe	forb/herb
Myriophyllum humile	lowly water-milfoil	forb/herb

Myriophyllum tenellum	leafless water-milfoil	forb/herb
Nuphar variegata	yellow water-lily	forb/herb
Nuttallanthus canadensis	blue toad-flax	forb/herb
Nymphaea odorata ssp. odorata	white water lily	forb/herb
Nymphoides cordata	little floating heart	forb/herb
Oenothera biennis	common evening primrose	forb/herb
Oenothera fruticosa	narrowleaf evening primrose	forb/herb
Oenothera parviflora	northern (small flower) evening primrose	forb/herb
Oenothera perennis	little evening primrose	forb/herb
Orobanche uniflora	one-flowered cancer-root	forb/herb
Orontium aquaticum	golden club	forb/herb
Oxalis stricta	yellow wood sorrel	forb/herb
Packera aurea	golden ragwort	forb/herb
Peltandra virginica	arrow-arum	forb/herb
Physalis heterophylla	clammy ground-cherry	forb/herb
Phytolacca americana	pokeweed	forb/herb
Pityopsis falcata	golden aster	forb/herb
Plantago maritima var. juncooides	seaside plantain	forb/herb
Platanthera blephariglottis	white-fringed orchid	forb/herb
Platanthera lacera	ragged-fringed orchid	forb/herb
Pluchea odorata var. succulenta	saltmarsh-fleabane	forb/herb
Pogonia ophioglossoides	rose pogonia, snakemouth orchid	forb/herb
Polygala cruciata	cross-leaved milkwort, drumheads	forb/herb
Polygala paucifolia	flowering wintergreen	forb/herb
Polygala polygama	bitter milkwort	forb/herb
Polygala sanguinea	purple milkwort	forb/herb
Polygonatum pubescens	Solomon's seal	forb/herb
Polygonella articulata	jointweed	forb/herb
Polygonum amphibium var. emersum	erect water smartweed	forb/herb
Polygonum arifolium	halberd-leaf tearthumb	forb/herb
Polygonum buxiforme	box-leaf knotweed	forb/herb
Polygonum glaucum	seabeach knotweed	forb/herb
Polygonum hydropiper	water-pepper	forb/herb
Polygonum hydropiperoides	false water-pepper	forb/herb
Polygonum lapathifolium var. salicifolium	willow-weed	forb/herb
Polygonum pennsylvanicum	Pennsylvania smartweed	forb/herb
Polygonum punctatum var. confertiflorum	annual water-smartweed	forb/herb
Polygonum punctatum var. punctatum	perennial water-smartweed	forb/herb
Polygonum ramosissimum var. prolificum	bushy knotweed	forb/herb
Polygonum sagittatum	arrow-leaf tearthumb	forb/herb
Polygonum scandens var. cristatum	winged bindweed	forb/herb
Polygonum scandens var. scandens	climbing false buckwheat	forb/herb
Pontederia cordata	pickerel weed	forb/herb
Potamogeton amplifolius	big-leaved pondweed	forb/herb
Potamogeton bicupulatus	hairlike pondweed	forb/herb
Potamogeton ephedrus	surface pondweed	forb/herb
Potamogeton perfoliatus	clasping pondweed	forb/herb
Potamogeton pusillus var.	slender tiny pondweed	forb/herb

tenuissimus		
Potamogeton spirillus	northern snailseed pondweed	forb/herb
Potentilla canadensis	common cinquefoil	forb/herb
Potentilla norvegica	rough cinquefoil	forb/herb
Potentilla simplex	old field cinquefoil	forb/herb
Prenanthes trifoliolata	fall rattlesnake root	forb/herb
Proserpinaca palustris	mermaid weed	forb/herb
Prunella vulgaris ssp. lanceolata	wild heal-all	forb/herb
Pseudognaphalium obtusifolium	fragrant cudweed	forb/herb
Ptilimnium capillaceum	mock bishop's-weed	forb/herb
Pyrola amricana	American wintergreen	forb/herb
Pyrola chlorantha	green pyrola	forb/herb
Pyrola elliptica	elliptic pyrola	forb/herb
Ranunculus abortivus	kidney-leaf buttercup	forb/herb
Ranunculus cymbalaria	seaside crowfoot	forb/herb
Ranunculus sceleratus	celery-leaf crowfoot	forb/herb
Rhexia mariana	Maryland meadow-beauty	forb/herb
Rhexia virginica	northern meadow beauty	forb/herb
Rorippa palustris ssp. fernaldiana	marsh yellowcress	forb/herb
Rumex orbiculatus	great water dock	forb/herb
Ruppia maritima	widgeon-grass	forb/herb
Sabatia kennedyana	Plymouth gentian	forb/herb
Sagittaria latifolia	broad-leaved arrowhead	forb/herb
Sagittaria teres	slender arrowhead	forb/herb
Salicornia bigelovii	dwarf glasswort	forb/herb
Salicornia maritima	samphire	forb/herb
Salicornia virginica	perennial saltwort	forb/herb
Samolus valerandi ssp. parviflorus	water-pimpernel	forb/herb
Sanicula marilandica	black snakeroot	forb/herb
Sarracenia purpurea	pitcher plant	forb/herb
Scrophularia lanceolata	American figwort	forb/herb
Scutellaria galericulata	common skullcap	forb/herb
Scutellaria lateriflora	blue skullcap	forb/herb
Sibbaldiopsis tridentata	three-toothed cinquefoil	forb/herb
Silene antirrhina	sleepy catchfly	forb/herb
Sisyrinchium angustifolium	stout blue-eyed grass	forb/herb
Sisyrinchium atlanticum	eastern blue-eyed grass	forb/herb
Sisyrinchium fuscum	sandplain blue-eyed grass	forb/herb
Sium suave	water-parsnip	forb/herb
Solanum ptychanthum	American black nightshade	forb/herb
Solidago bicolor	white goldenrod	forb/herb
Solidago canadensis	Canada goldenrod	forb/herb
Solidago juncea	early goldenrod	forb/herb
Solidago latissimifolia	coastal goldenrod	forb/herb
Solidago macrophylla	big-leaved goldenrod	forb/herb
Solidago nemoralis	gray goldenrod	forb/herb
Solidago odora	sweet goldenrod	forb/herb
Solidago puberula	downy goldenrod	forb/herb
Solidago rugosa ssp. rugosa var. rugosa	wrinkle-leaved goldenrod	forb/herb
Solidago sempervirens	seaside goldenrod	forb/herb
Solidago uliginosa var. linoides	slender swamp goldenrod	forb/herb
Sparganium americanum	common bur-reed	forb/herb
Sparganium androcladum	shinning bur-reed	forb/herb
Spergularia canadensis	sand-spurrey	forb/herb
Spergularia salina	saltmarsh sand-spurrey	forb/herb

Spiranthes cernua	nodding ladies-tresses	forb/herb
Spiranthes lacera	slender ladies-tresses	forb/herb
Spiranthes tuberosa	little ladies-tresses	forb/herb
Stachys hyssopifolia	hyssop hedge-nettle	forb/herb
Strophostyles helvula	wild bean	forb/herb
Suaeda linearis	slender sea-blite	forb/herb
Suaeda maritima	sea-blite	forb/herb
Suaeda maritima ssp. richii	Rich's sea-blite	forb/herb
Symphyotrichum dumosus var. subulifolius	long-stalked aster	forb/herb
Symphyotrichum ericoides	white heath aster	forb/herb
Symphyotrichum novae-angliae	New England Aster	forb/herb
Symphyotrichum novi-belgii	New York aster	forb/herb
Symphyotrichum patens var. patens	late purple aster	forb/herb
Symphyotrichum patens var. phlogifolius	phlox-leaf aster	forb/herb
Symphyotrichum pilosus var. pilosus	hairy aster	forb/herb
Symphyotrichum pilosus var. pringlei	Pringle's aster	forb/herb
Symphyotrichum subulatus var. euroauster	small-flowered aster	forb/herb
Symphyotrichum undulatus	waxy-leaved aster	forb/herb
Tephrosia virginiana	goat's rue	forb/herb
Teucrium canadense	American germander	forb/herb
Thalictrum pubescens	tall meadow-rue	forb/herb
Triadenum virginicum	marsh St. John's-wort	forb/herb
Trichostema dichotomum	forked blue curls	forb/herb
Trientalis borealis	starflower	forb/herb
Triglochin maritimum	saltmarsh arrow-grass	forb/herb
Triodanis perfoliata	Venus' looking grass	forb/herb
Urtica dioica	stinging nettle	forb/herb
Utricularia biflora	two-flowered bladderwort	forb/herb
Utricularia cornuta	horned bladderwort	forb/herb
Utricularia geminiscapa	hidden-fruited bladderwort	forb/herb
Utricularia gibba	fibrous bladderwort	forb/herb
Utricularia purpurea	purple bladderwort	forb/herb
Utricularia resupinata	resupinate bladderwort	forb/herb
Utricularia subulata	subulate bladderwort	forb/herb
Vallisneria americana	tape grass	forb/herb
Verbena hastata	blue vervain	forb/herb
Viola cucullata	blue marsh-violet	forb/herb
Viola lanceolata var. lanceolata	lance-leaved violet	forb/herb
Viola macloskeyi ssp. pallens	northern white violet	forb/herb
Viola sagittata	arrow-leaf violet	forb/herb
Xanthium strumarium var. canadense	cocklebur	forb/herb
Xyris difformis	yellow-eyed grass	forb/herb
Xyris smalliana	quagmire yellow-eyed grass	forb/herb
Zostera marina	eelgrass	forb/herb
Juncus acuminatus	sharp-fruited rush	rush
Juncus articulatus	jointed rush	rush
Juncus balticus	brackish rush	rush
Juncus bufonius	toad-rush	rush
Juncus canadensis	Canada rush	rush

Juncus debilis	weak rush	rush
Juncus dichotomus	forked rush	rush
Juncus effusus var. conglomeratus	common rush	rush
Juncus effusus var. pylae	common rush	rush
Juncus effusus var. solutus	lamp rush	rush
Juncus gerardi	black rush	rush
Juncus greenei	rush	rush
Juncus marginatus	grass-leaf rush	rush
Juncus militaris	bayonet rush	rush
Juncus pelocarpus	pondshore rush	rush
Juncus tenuis	path rush	rush
Luzula echinata	hedgehog wood-rush	rush
Luzula multiflora ssp. frigida	boreal wood-rush	rush
Luzula multiflora ssp. multiflora	common wood-rush	rush
Bulbostylis capillaris	sand-sedge	sedge
Carex albicans var. albicans	variable sedge	sedge
Carex albicans var. emmonsii	Emmon's sedge	sedge
Carex annectens	yellow fox-sedge	sedge
Carex atlantica ssp. atlantica	Atlantic prickly sedge	sedge
Carex atlantica ssp. capillacea	Howe's prickly sedge	sedge
Carex canescens ssp. Disjuncta	silvery bog-sedge	sedge
Carex comosa	bristly sedge	sedge
Carex debilis var. rudgei	northern stalked sedge	sedge
Carex echinata	prickly sedge	sedge
Carex hormathodes	saltmarsh straw-sedge	sedge
Carex intumescens	swamp-sedge	sedge
Carex limosa	mud-sedge	sedge
Carex longii	Long's sedge	sedge
Carex lurida	sallow sedge	sedge
Carex mitchelliana	Mitchell's awned-sedge	sedge
Carex muehlenbergii var. muehlenbergii	Muhlenberg's sedge	sedge
Carex muehlenbergii var. enervis	Muhlenberg's sedge	sedge
Carex nigra	black sedge	sedge
Carex novae-angliae	New England sedge	sedge
Carex oligosperma	few-fruited sedge	sedge
Carex pennsylvanica	Pennsylvania sedge	sedge
Carex retrorsa	hooked sedge	sedge
Carex scoparia	broom-sedge	sedge
Carex silicea	seabeach sedge	sedge
Carex stipata	awl-fruited sedge	sedge
Carex striata var. brevis	Walter's sedge	sedge
Carex swanii	Swan's sedge	sedge
Carex tenera	slender straw-sedge	sedge
Carex trisperma var. billingsii	three-seeded bog-sedge	sedge
Carex umbellata	short-beaked sand sedge	sedge
Carex utriculata	bottle-sedge	sedge
Carex vulpinoidea	fox-sedge	sedge
Cladium mariscoides	twig-rush	sedge
Cyperus dentatus	toothed flatsedge	sedge
Cyperus diandrus	red-edged flatsedge	sedge
Cyperus esculentus	yellow flatsedge	sedge
Cyperus filicinus	saltpond flatsedge	sedge
Cyperus grayi	Gray's flatsedge	sedge
Cyperus lupulinus ssp. lupulinus	slender sand flatsedge	sedge

Cyperus lupulinus ssp. macilentus	sand flatsedge	sedge
Cyperus odoratus	saltmarsh flatsedge	sedge
Cyperus polystachyos var. texensis	Texas flatsedge	sedge
Cyperus strigosus	straw-colored flatsedge	sedge
Dulichium arundinaceum	threeway sedge	sedge
Eleocharis acicularis	needle spike-sedge	sedge
Eleocharis elliptica	orange-fruited spike-sedge	sedge
Eleocharis halophila	saline spike-sedge	sedge
Eleocharis melanocarpa	black-fruited spike-sedge	sedge
Eleocharis olivacea	olive spike-sedge	sedge
Eleocharis ovata var. obtusa	ovate spike sedge	sedge
Eleocharis palustris var. major	creeping spike-sedge	sedge
Eleocharis parvula	dwarf spike-sedge	sedge
Eleocharis robbinsii	Robbin's spike-sedge	sedge
Eleocharis rostellata	spike-rush	sedge
Eleocharis smallii	Small's spike-sedge	sedge
Eleocharis tenuis	slender spike-rush	sedge
Eriophorum tenellum	rough cotton-grass	sedge
Eriophorum virginicum	Virginia cotton-grass	sedge
Fimbristylis autumnalis	autumn fimbry	sedge
Fuirena pumila	annual umbrella-grass	sedge
Rhynchospora alba	white beak-sedge	sedge
Rhynchospora capitellata	brown beak-sedge	sedge
Rhynchospora fusca	sooty beak-sedge	sedge
Rhynchospora scirpoides	long-beaked bald-sedge	sedge
Schoenoplectus maritimus	seaside bullsedge	sedge
Schoenoplectus pungens	common threesquare	sedge
Schoenoplectus robustus	saltmarsh bullsedge	sedge
Schoenoplectus subterminalis	floating club-sedge	sedge
Schoenoplectus tabernaemontani	soft-stemmed bullsdge	sedge
Scirpus americanus	chairmaker's bulrush	sedge
Scirpus atrocinctus	northern bullsedge	sedge
Scirpus cyperinus	woolgrass	sedge
Scirpus expansus	spreading bullsedge	sedge
Parthenocissus quinquefolia	Virginia creeper	vine
Parthenocissus vitacea	grape-woodbine	vine
Smilax glauca	catbrier	vine
Smilax herbacea	carrion flower	vine
Smilax hispida	bristly greenbrier	vine
Smilax rotundifolia	common catbrier	vine
Toxicodendron radicans	poison ivy	vine
Vitis aestivalis	summer grape	vine
Vitis labrusca	fox-grape	vine
Alnus serrulata	smooth alder	shrub
Amelanchier arborea var. laevis	serviceberry	shrub
Amelanchier canadensis	juneberry	shrub
Amelanchier stolonifera	running shadbush	shrub
Andromeda polifolia var. glaucophylla	bog-rosemary	shrub
Arctostaphylos uva-ursi ssp. coactilis	bearberry	shrub
Baccharis halimifolia	groundsel-tree	shrub
Cephalanthus occidentalis	buttonbush	shrub
Chamaedaphne calyculata var. angustifolia	leatherleaf	shrub

Chimaphila maculata	spotted wintergreen	shrub
Chimaphila umbellata ssp. cisatlantic	pipsissewa	shrub
Clethra alnifolia	coast white alder	shrub
Comptonia peregrina	sweet fern	shrub
Corema conradii	broom crowberry	shrub
Cornus canadensis	bunchberry	shrub
Cornus sericea	red-osier dogwood	shrub
Crataegus cryocarpa	hawthorn	shrub
Decodon verticillatus	water-willow	shrub
Empetrum nigrum	crowberry	shrub
Empetrum rubrum	red crowberry	shrub
Epigaea repens	trailing arbutus	shrub
Gaultheria procumbens	wintergreen	shrub
Gaylussacia baccata	black huckleberry	shrub
Gaylussacia dumosa	dwarf huckleberry	shrub
Gaylussacia frondosa	dangleberry	shrub
Hamamelis virginiana	witch-hazel	shrub
Hudsonia ericoides	golden heather	shrub
Hudsonia tomentosa	beach heather	shrub
Ilex glabra	inkberry	shrub
Ilex verticillata	winterberry	shrub
Iva frutescens ssp. oraria	saltmarsh-elder	shrub
Kalmia angustifolia	sheep laurel	shrub
Lespedeza capitata	round-headed bush-clover	shrub
Leucothoe racemosa	swamp fetterbush	shrub
Lyonia ligustrina	maleberry	shrub
Myrica gale	sweet gale	shrub
Myrica pennsylvanica	northern bayberry	shrub
Photinia arbutifolia	red chokeberry	shrub
Photinia melanocarpa	black chokeberry	shrub
Photinia prunifolia	purple chokeberry	shrub
Prunus maritima	beach plum	shrub
Rhododendron viscosum	swamp azalea	shrub
Rhus copallinum var. latifolia	winged sumac	shrub
Rhus glabra	smooth sumac	shrub
Rhus hirta	staghorn sumac	shrub
Ribes hirtellum	swamp gooseberry	shrub
Rosa carolina	pasture rose	shrub
Rosa palustris	swamp rose	shrub
Rosa virginiana	Virginia rose	shrub
Rubus allegheniensis	common blackberry	shrub
Rubus flagellaris	northern dewberry	shrub
Rubus hispidus	swamp dewberry	shrub
Rubus idaeus ssp. strigosus	wild red raspberry	shrub
Rubus occidentalis	black raspberry	shrub
Rubus pensilvanicus	highbush blackberry	shrub
Rubus recurvicaulis	arching sand blackberry	shrub
Salix bebbiana	Bebb's willow	shrub
Salix cordata	heart-leaf willow	shrub
Salix discolor	pussy-willow	shrub
Salix eriocephala	Missouri River willow	shrub
Salix humilis	upland willow	shrub
Salix lucida	shining willow	shrub
Salix nigra	black willow	shrub
Sambucus canadensis	common elderberry	shrub

Spiraea alba var. latifolia	meadowsweet	shrub
Spiraea tomentosa	steeplebush	shrub
Toxicodendron vernix	poison sumac	shrub
Vaccinium angustifolium	lowbush blueberry	shrub
Vaccinium corymbosum	highbush blueberry	shrub
Vaccinium fuscatum	black highbush blueberry	shrub
Vaccinium macrocarpon	American cranberry	shrub
Vaccinium oxycoccos	small cranberry	shrub
Vaccinium pallidum	lowbush blueberry	shrub
Vaccinium stamineum	huckleberry	shrub
Viburnum dentatum	arrow-wood	shrub
Viburnum nudum var. cassinoides	withe-rod	shrub
Acer rubrum	red maple	tree
Alnus incana ssp. rugosa	speckled alder	tree
Betula papyrifera	paper birch	tree
Betula populifolia	gray birch	tree
Carya alba	mockernut	tree
Carya glabra	mockernut	tree
Chamaecyparis thyoides	Atlantic white cedar	tree
Corylus americana	hazelnut	tree
Corylus cornuta	beaked hazelnut	tree
Fagus grandifolia	American beech	tree
Ilex opaca	American holly	tree
Juniperus virginiana	eastern red cedar	tree
Nyssa sylvatica	black gum	tree
Ostrya virginiana	hop-hornbeam	tree
Pinus rigida	pitch pine	tree
Pinus strobus	white pine	tree
Populus grandidentata	big-toothed aspen	tree
Populus tremuloides	quacking aspen	tree
Prunus pensylvanica	pin-cherry	tree
Prunus serotina	black cherry	tree
Prunus spinosa	blackthorne	tree
Prunus virginiana	choke-cherry	tree
Quercus alba	white oak	tree
Quercus ilicifolia	scrub oak	tree
Quercus palustris	pin oak	tree
Quercus prinoides	dwarf chinquapin oak	tree
Quercus rubra	red oak	tree
Quercus velutina	black oak	tree
Sassafras albidum	sassafras	tree
Tilia americana var. americana	coastal basswood	tree
Viburnum lentago	nannyberry	tree

Appendix C

Applicable Building Codes and Landscape Regulations

Applicable Building Codes

Federal legislation and National Park Service policies clearly stipulate that as buildings are rehabilitated, accepted model building codes shall be met to the maximum extent feasible. Any variances will need to be clearly specified in review documents.

The fire and life safety codes referenced below have been adopted to prescribe requirements consistent with nationally recognized good practices for the safeguarding to a reasonable degree of life and property from the general conditions present in the occupancy of buildings and from the hazards of fire and explosion arising from the storage, handling and use of hazardous substances, materials and devices. All rehabilitation construction projects will require fire suppression sprinkler and/or fire detection alarm systems.

The following is a list of applicable codes:

- Uniform Building Code (UBC)
- National Electric Code
- Uniform Mechanical Code (UMC)
- Uniform Plumbing Code
- Uniform Fire Code (UFC)
- Uniform Federal Accessibility Standards
- National Fire Protection Association Life-Safety Code
- International (or CABO) One and Two Family Dwelling Code
- Americans with Disabilities Act of 1990, as amended in 2002

The Americans with Disabilities Act establishes federal guidelines that define requirements for disabled access to parking facilities, pathways, and buildings. Installing ramps, lifts, or interior elevators may be necessary depending on the current accessibility of particular sites. For example, a Partner may need to install a ramp from a sidewalk to a door if the doorway is elevated and no accessible entrance currently exists. In all cases, however, sidewalks, exhibits, and the entrances to Partner buildings will need to meet ADA stipulations to the extent practical.

Since the Highlands Center is on federal land, program uses and building rehabilitation projects do not require conventional municipal zoning designations, plan checks, and town building department approvals. However, the proposed Highlands Center is consistent with permitted uses in the Town of Truro's Seashore District zoning designation. Pursuant to 40 U.S.C. Section 619(b), Congress has mandated that Federal agencies may construct or alter buildings "only after consideration of all requirements (other than procedural) of (1) zoning laws, and (2) laws relating to landscaping, open space, minimum distance from the property line, maximum height...of a State or a political subdivision of a State which would apply to the building if it were not a building constructed or leased by a Federal agency". To carry out the purposes of said provision, Program Partners will be required to consult with the appropriate local officials, upon request, to

submit plans to local officials for an opportunity to comment for a reasonable period of time not to exceed 30 days, and permit inspection of construction or alterations upon reasonable notice of their intention to conduct such inspections before conducting the same. See 40 U.S. C. Section 619(c).

The NPS will be responsible for final approval of building projects. The NPS has developed a system of site and building rehabilitation plan reviews similar to municipal procedures. The NPS (and its Management Partner or designated review committee) will review and approve site and building design and construction plans.

This system of plan reviews will include oversight by the NPS structural fire safety contact at the Regional Office and a Fire Management Officer at CCNS South District Maintenance. These fire safety inspectors perform inspections of all buildings within Cape Cod National Seashore. Partners will need to contract for fire safety inspections while construction is in progress and to contract for life safety inspections upon building completion and prior to occupancy. Partners are also responsible for any necessary consultation with the Town of Truro Fire Department.

The NPS reserves the right to collect administrative charges to reimburse the NPS for its related expenses, such as reviewing plans and monitoring code compliance and construction to ensure conformance with approved designs. No construction may be undertaken unless the NPS has issued a written approval to proceed.

Applicable Landscape Regulations

All changes or modifications to the landscape or site within leased or permitted premises proposed by a Partner require approval from the NPS. Reference should be made to the above list of applicable building codes for such site modifications as handicapped accessible ramps, decks, walkway railings, and other improvements that may be covered under building codes. The Americans with Disabilities Act (ADA) is listed under the applicable building codes above and meeting the requirements of the ADA is mandatory for every landscape or building rehabilitation project. Some features meant to address ADA requirements shall be consistent throughout the site. These items will include ramps that will be reviewed for consistency in design during the project design review process. In addition, the following regulations and review procedures apply to landscape and site work:

Archaeological Analysis:

Partners must obtain approval from the NPS before performing any ground disturbing activity, including plantings and fencing, because federal property is subject to the National Historic Preservation Act, as amended, and the Archaeological Resources Protection Act. It may be necessary for Partners to employ archaeologists in order to perform tests, to identify the significance of sites or artifacts, to provide sufficient research on the area of disturbance to allow excavation, or to monitor ground disturbance activities while they are occurring. When undertaking approved ground disturbing activity, the Partner shall halt any activities and notify the NPS upon discovery of findings, to ensure protection of archaeological or historical findings. All artifacts unearthed remain the property of the United States of America.

National Environmental Policy Act Compliance:

The National Environmental Policy Act (NEPA) requires consideration of the environmental effects of proposed federal actions. The act ensures that environmental information is available to public officials and to the public before decisions are made or actions are taken. The 1999 *Site Plan and Environmental Assessment for the Former North Truro Air Force Station* secured the overall required regulatory approvals for redeveloping the Highlands Center site in accordance with the National Environmental Policy Act (NEPA). Further state and local consultation and approvals will be needed to address the Department of Environmental Protection's water quality protection issues, particularly septic facility installation and well protection. In addition to obtaining appropriate NPS and other agency environmental approvals, if some Partner modification proposals are beyond what has been cleared under NEPA these proposals will require further impact analysis if there is conceptual agreement by the NPS to proceed.

Species of Concern and Invasive Exotic Species (Federal and State):

Preserving the ecological character of the Highlands Center is of utmost importance because the habitat along the coastal bluffs is fragile. Engaging in conservation is as simple as not causing erosion by using or creating undesignated (social) trails, limiting one's wastefulness, not littering, and adhering to all park regulations. Preservation measures are meant to protect threatened and endangered species as well as to prevent the invasion of exotic species. As the Highlands Center currently exists, there are no known species that fall into the categories of federal or state-listed threatened or endangered species. However, there is one protected state-listed species of special concern that is listed below.

Broom Crowberry (Corema conradii):

The only known state-listed species of special concern identified on Highlands Center property is the Broom Crowberry, a heathland plant that colonizes in fields and disturbed areas. All land slated for development or rehabilitation will be subject to inspection by a plant ecologist for the possibility of existing Broom Crowberry habitat. The plant ecologist will notify the NPS who will guide contact with the Massachusetts Natural Heritage and Endangered Species Program should Broom Crowberry be found in a project area.

Invasive Exotic Species and Integrated Pest Management

Cape Cod National Seashore has a "Management Plan and Environmental Assessment for Invasive Exotic Plant Species Control" and an Integrated Pest Management (IPM) Plan. This plan outlines appropriate actions to take when attempting to curb or stop the growth of any currently identified invasive exotic plant species. The IPM document lists plants targeted for control and provides the mandated IPM procedure. The NPS policy document regarding pesticides and herbicides will be made available to each Partner.

As mandated by Federal regulations and NPS policy, no one may use pesticides or herbicides in a national park without obtaining approval from the park IPM coordinator.

Appendix D

Hazardous Materials Mitigation Remediation and Disposal

Program Partners are advised to review these requirements for hazardous materials remediation with their architect or engineer in order to determine if they need assistance from an environmental engineer, industrial hygienist or hazardous waste and abatement specialist.

An initial preliminary assessment of possible hazardous building materials is available in the two building condition analyses completed in 2000 and 2001 that were performed under contract with the NPS (see references). These general investigations were meant to collect known information about hazardous materials but were by no means exhaustive. Partners must individually evaluate each building for existing hazardous materials prior to abatement and disposal or encapsulation to verify earlier findings and to develop specific strategies for handling materials. Hazardous materials that are known to be present in some of the Highlands Center buildings include, but are not limited to:

- Asbestos-containing materials (including siding and floor tiles, drywall compound, adhesives, pipe insulation, roofing)
- Lead-based paint
- Oil and other hazardous materials (including mercury, PCBs, mechanical equipment containing oils, CFCs, or old cleansers, batteries, oils and solvents and possible pesticide residue in soils).

Remediation of hazardous materials must comply with applicable federal and state laws, regulations and codes, including requirements for state-certified abatement specialists and proper methods of abatement and disposal or encapsulation. Current applicable codes will be provided upon request so the most up-to-date information is supplied. Storage and disposal of hazardous material must be in compliance with 40 CFR (Environmental Protection Agency) and 310 CMR 30.00 (Massachusetts Department of Environmental Protection Hazardous Waste Regulations). Proof of compliance with such laws and regulations is necessary, including location of disposal area. No occupancy of buildings is permitted prior to hazardous materials abatement and compliance with all applicable building codes and state and federal hazardous waste regulations.

The entire process for project submittal and approval is outlined in Appendix E entitled “Project Development and Review” in the Highlands Center Design and Rehabilitation handbook.

Appendix E

Project Development and Review

This section outlines the process for submitting a site and/or building rehabilitation project at the Highlands Center for NPS review and approval. It also includes a description of the various phases of the project development process, from pre-design decisions such as programming spaces, to steps involved during the construction process. Site modifications and building projects involve many phases and can appear complex. This Handbook attempts to demystify the project process and to outline those steps needed for acquiring permit approval. A project flow chart is included to illustrate the process.

Any project requiring physical changes to the landscape or to the interior or exterior of a structure will require a construction permit from the NPS. This permit will become an inherent part of the signed lease and will include specific conditions of work and requirements for building occupancy. The building codes and the suggested Principles for Environmental Sustainability apply to all projects – exterior and interior. In addition, the Architectural and Site Design Guidelines apply to exterior modifications only.

A. Overall Site and Building Rehabilitation Project Review Process

The entire building construction process has several major parts: Pre-design, Schematic Design, Design Development, Construction Documents, Bidding and Construction. These phases outline the path of the project from the initial design idea to ongoing refinement to actual construction.

When a Partner makes a building project proposal, this proposal will be reviewed for compliance with applicable building codes, site and architectural design guidelines (if exterior modifications are being made), and sustainable design suggestions at each stage of the review process. However, all code compliance will ultimately be the responsibility of the applicant. Proposals will also be reviewed for compatibility with NPS management policies and park operating procedures.

Licensed professionals (architects/ engineers) are required to prepare all drawings and specifications. Drawings must be stamped by licensed professionals representing project-appropriate disciplines.

Interior-only projects (e.g. moving walls, new plumbing, and new flooring) will require one formal review. This submittal is required at the completion of the Construction Document phase. Partners are encouraged to ask questions and to make unofficial submittals prior to construction document completion, as needed to clarify issues and requirements. Projects proposing any exterior modification will involve four formal submittals for review. These submittals are required at the completion of the Schematic Design, 75% Design Development, 100% Design Development and 75% Construction Document phases. For all projects, at the conclusion of construction, a complete set of archival as-built drawings and other project records must be submitted to the NPS. Please see below for specific submittal requirements. Submissions should follow these general guidelines:

- Site plans at minimum of 1/16" = 1'-0"
- Elevations at minimum of 1/8" = 1'-0"
- Floor plans at minimum of 1/8" = 1'-0"
- Three sets of drawings and accompanying documentation are required for each formal submittal.

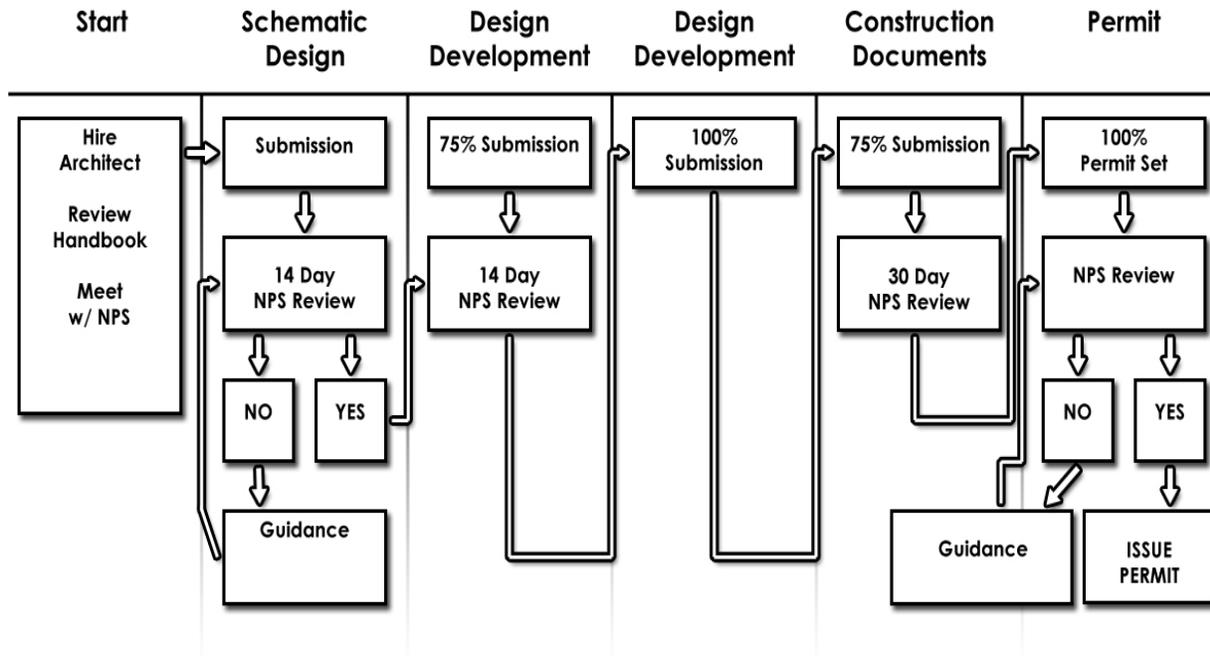
Each submission will be followed by a formal response from the NPS. The review schedule is as follows:

Phase	Review Period
100% complete schematic design	14-21 day NPS review period
75% design development	14-21 day NPS review period
100% design development	No waiting period for review – Partner may begin construction documents phase at once
75% construction documents	30 day NPS review period

Partners are responsible for addressing NPS comments and submitting applicable revisions before proceeding to the next phase. It is intended that the NPS and Partners will work collaboratively throughout the review process and NPS staff will be available (through the Highlands Center Project Manager) for collaborative assistance throughout the project.

B. Building Project Process and Review Requirements

The project flow chart and following explanation summarizes the steps of the project building process and review requirements at the Highlands Center.



Project Flow Chart shows the flow of required submissions, review periods and key project approval points.

Pre-Design

The pre-design phase is the research and start-up phase of the project. Partners should review existing documents, reports and studies, discuss goals, develop a scope of work, select consultant architects, architectural designers, engineers, and designer/builders, as the job requires.

During this phase, Partners should begin code and structural analyses as needed. The intent is to ensure the design team is aware of the opportunities and constraints affecting the site and structures, as well as potential impacts and acceptable mitigation. After these factors are known, partners can develop building program information that will lead to preliminary solutions, schedule, and budgets in later phases. It is required that the selected architect/engineer meets with the NPS to discuss project goals and these guidelines.

Schematic Design

Consultants complete preliminary, conceptual design development drawings and project cost estimates for building rehabilitation plans (schematic design concepts) during this phase.

Completed Schematic Design materials should convey the entire scope of the rehabilitation in general terms. At this phase, drawings can be annotated sketches.

Design Development Phase

The schematic design is refined during the Design Development phase. The design drawings and supporting materials are more comprehensive in scope than in the Schematic Design phase. Consultants complete construction drawings and specifications to meet applicable building codes and OSHA worker safety regulations and to direct construction, including exterior and interior architectural and structural repairs, and installation of mechanical, electrical, and plumbing and fire protection systems (including fire suppression, if applicable). Design Development drawings must be submitted for NPS review at 75% of design completion. Plans will also be reviewed by an archeologist if any ground disturbance is proposed to determine if archeological assessment is needed. Comments will be returned to Partners within 14 days and a resubmission will be required to NPS at 100% completion of Design Development. The Partner can proceed directly to Construction Documents phase (no review period for 100% submission), although NPS comments may follow if comments from 75% review are not completely addressed, as needed.

Construction Documents

For all rehabilitation proposals, Construction Documents must be submitted for review and approval when 75% complete. If the Town requests such review, the Partner will allow the Town of Truro a 30-day plan review during which time the Town will be given an opportunity to indicate any non-binding suggestions or comments.

After NPS review, Partners shall incorporate any final comments into the construction documents and shall submit the 100% complete set for final approval. Approved documents will serve as the permit drawings for construction. All changes from the permit drawings must be approved in writing by the NPS prior to implementation of any change.

Construction Permit

When the 100% Construction Documents are complete and have incorporated requested NPS revisions, the NPS shall issue a Construction Permit to the Partner. The Construction Permit will state the terms of construction.

The Building or Construction Permit serves as the written authorization to proceed for all work and must be obtained from the NPS prior to commencement of any excavation, demolition, removal, construction or alteration of any Highlands Center site or structure. A Construction Permit, including specific Conditions of Work that must be met for construction to proceed, will be issued when the NPS is satisfied that a complete set of construction documents, incorporating all previous review comments, has been received.

Conditions of Work are items that must be completed prior to the commencement of work on site. These include such things as the preparation and approval of a construction management plan, work area staging plan, safety and health plan, hazardous materials remediation plan (as required), and similar tasks which are typically completed before groundbreaking. Archeological discoveries during demolition and/or construction will require further review by the NPS in consultation with the partner's archeologist. The Construction Permit and Conditions of Work will serve as the Notice to Proceed, permitting the start of actual construction on-site. Issuance of the permit is contingent upon the completion of all pre-construction requirements.

Changes during construction requiring scope and contract modifications will be reported if material changes in design and specifications are required.

Document Formats and Standards

Document submittals must be compatible with the following standards, particularly for final “as-built” documentation of projects. The project files will become part of the Highlands Center project archives, and may be used for research, operations and maintenance, emergency services, etc.

Design development and construction document submissions will include all architectural and engineering drawings at full size (of at least 20" x 30") and all associated architectural, engineering, hazardous materials analysis and other relevant reports. At the completion of construction, Partners must submit complete as-built drawings of archival quality and associated electronic files in NPS-approved formats. Electronic text files shall be MS Word and MS Excel. Electronic drawing files shall be produced on AutoCAD. All electronic files should be saved using the latest version of the appropriate software or on earlier versions of software, as the NPS requires. Complete files for all drawings, reports, etc. must be submitted. Electronic materials shall be provided on CD-Rom or in accordance with current technology.

Review Requirements

Interior-only Rehabilitation Projects

Submit Construction Documents including:

- Specifications
- Construction cost estimates and schedules
- All plan, section and elevation drawings
 - These drawings shall be of sufficient clarity to indicate the location, nature and extent of the work proposed. The drawings shall show in detail conformance with the provisions of all applicable building codes, relevant laws, bylaws, rules and regulations.
- Photographs, material samples and other detail and visuals that help relay the design intent shall be provided where practical.

Exterior Rehabilitation Projects

Drawings and supporting documentation shall be submitted for various phases.

Submit Schematic Design drawings/documents including:

- Site analysis identifying opportunities and constraints, potential impacts and suggested mitigation
- General landscaping layout showing proposed topography, circulation and vegetation changes
- Location of all utility features such as backflow preventors, transformers, etc.
- Building massing and/or exterior elevations
- Accessibility upgrades
- Window and door openings
- All proposed exterior and interior changes
- Any proposed structural changes
- Proposed material changes
- Proposed colors, if applicable
- Building program identifying uses

Submit Design Development drawings including:

- The submittal should include everything outlined under Schematic Design above in addition to list below.
- Hazardous materials remediation
- Proposed demolition
- Rehabilitation
- Proposed systems (mechanical, electrical, plumbing, life-safety, etc.)
- Planting plan and plant list
- Technical reports
- Project schedule and cost estimate
- Proposed construction work area for staging materials, construction trailers, construction debris dumpsters, etc.

Submit Construction Documents including:

- Plan, section and elevation drawings
 - These drawings shall be of sufficient clarity to indicate the location, nature and extent of the work proposed. The drawings shall show in detail conformance with the provisions of all applicable building codes, relevant laws, bylaws, rules and regulations.
- Specifications
- Construction cost estimates and schedules
- Photographs, material samples and other detail and visuals that will help relay the design intent shall be provided where practical.

C. Construction Project Implementation

Project inspection and supervision must be clearly and thoroughly addressed in construction documents so that any issues that arise during construction are brought to the appropriate party's attention as soon as possible. All changes for exterior elements of the project, both building and landscape, must be reviewed by the NPS review committee.

Finally, as is customary practice and under the terms of the lease, no occupancy (full or partial) of individual buildings will be allowed until all construction and utility services are complete in the interests of satisfying all basic life safety codes.